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स्वचालित मौसम स्टेशनों के सामान्य मार्गदर्शी सिद्धान्त

GENERAL GUIDELINES FOR AUTOMATIC WEATHER STATIONS

(First Reprint DECEMBER 1996)

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FOREWORD

A weather observing system which can measure and display/record *in-situ* or remotely meteorological parameters without the help of an observer is referred to as an automatic weather station. Such stations are in common use whenever round the clock observations are required from inaccessible areas like mountains, river catchments, remote islands, touchdown/take-off areas in airports, etc. Depending on the location and the specific data requirements, the parameters monitored differ. The guidelines given in this publication confine to automatic weather stations for use on land.

GENERAL GUIDELINES FOR AUTOMATIC WEATHER STATIONS

1 SCOPE

This prescribes the general guidelines for automatic weather stations for use on land.

2 PARAMETERS MONITORED

The most important parameters monitored by an airport automatic weather station are:

a) Wind speed,

b) Wind direction,

c) Dry bulb temperature,

d) Wet bulb temperature/dew-point temperature,

e) Pressure, and

f) Rainfall.

3 ACCURACY REQUIREMENTS AND ACCURACY ATTAINABLE

The International Civil Aviation Organization (ICAO), based on the requirements while landing and take-off of different types of aircraft, have laid down elaborate accuracy criteria for various parameters given above. Since, in practice, according to current state of the art, some of these accuracies are not attainable with existing instrumentation, ICAO has also laid down attainable accuracies. These are reproduced in Table 1.

4 INSTRUMENTATION

With the current state of technology, varieties of sensors are available for measuring almost every parameter. New sensors are under field tests/development in different parts of the world. Thus the sensor configurations are constantly changing and, therefore, any attempt to lay down comprehensive technical specifications for the various sensors will not be worthwhile. It is, therefore, proposed only to indicate broadly the type of sensors that are currently accepted as reliable. These sensors are listed in Table 2.

In addition to the parameters mentioned under para 1, in specific cases additional parameters are required to be monitored. These are listed in Table 3. The state of the instrumentation for these parameters is also undergoing rapid changes. Hence it is considered necessary only to lay down the accuracy criteria for these measurements as laid down by ICAO — PANS-MET. These are given in Table 4.

Different types of instruments are currently in use for the measurement of the parameters listed in Table 4. These instruments are under constant evaluation and improvement and hence it is not advisable at this juncture to give any more detailed technical specifications for these instruments.

4.1 Data Transmission

Data transmission from the field to the display recording site could either be through underground cables or through radio telemetry.

4.2 Data Display/Logging

A large variety of displays, data loggers and recorders are available for use with automatic weather stations. These are listed below:

a) *Display*:

— Digital — LED or LCD

— Monitor screen

— Analog meter

b) *Data logger*:

Multichannel data logger, microprocessor controlled logging on magnetic tapes/discs or solid state memories.

c) *Recorder*:

Galvanometric and/or potentiometric recorder — single or multichannel.

Table 1 Aeronautical Requirements for Meteorological Observations for Take-off and Landing and Accuracy Attainable

Sl No.	Parameter	Accuracy Desired	Accuracy Attainable
(1)	(2)	(3)	(4)
i)	Wind speed		
	a) Up to 10 kt	± 1 kt	± ½ kt
	a) Above 10 kt	± 10 % of the value	± 2 % of the value threshold 0·5 kt
ii)	Wind direction	± 10°	± 10 °
iii)	DB temperature	± 0·5°C	± 0·5°C
iv)	Dew-point	± 1°C	± 1°C
v)	Pressure	± 0·5 mb	—
vi)	Rainfall		
	Up to 10 mm	± 5 %	± 5 %
	Above 10 mm	± 10 %	± 10 %

Table 2 Proven Sensors Available for Meteorological Parameters

Sl No.	Parameter	Sensor
(1)	(2)	(3)
i)	Wind speed	a) Cup anemometer b) Propeller anemometer
ii)	Wind direction	a) Electrical windvane b) Aerovane
iii)	DB temperature	a) Thermistor thermometer b) Platinum resistance thermometer
iv)	Dew-point temperature	a) Lithium chloride dewcel b) Humidity sensitive solid state capacitor c) Wet bulb thermistor
v)	Pressure	a) Pressure transducer
vi)	Rainfall	a) Tipping bucket

Table 3 Additional Aeronautical Requirements for Meteorological Observations for Take-off and Landing and Accuracies Attainable

Sl No.	Parameter	Accuracy Desired	Accuracy Attainable
(1)	(2)	(3)	(4)
i)	Runway visual range	a) ± 50 m up to 500 m b) ± 100 m between 500 m and 1 000 m c) ± 200 m above 1 000 m	± 50 m up to 500 m ± 100 m between 500 m and 1 000 m ± 200 m above 1 000 m
ii)	Height of cloud based	a) ± 15 m up to 150 m b) ± 10 % between 150 m and 300 m c) ± 20 % above 300 m	±30 m up to 1 000 m ± 5 % to 10 % above 1 000 m
iii)	Rainfall	± 5 % up to 10 mm and ±10 % above (Measurement range 0 – 300 mm h⁻¹. Typical accuracy ± 0·25 mm, Vasiala Remote Weather Station)	± 5 % up to 10 mm and 10 % above

Table 4 Proven Sensors Available for Additional Meteorological Parameters

Sl No.	Parameter	Sensor
(1)	(2)	(3)
i)	Runway visual range	Fixed beam transmissometers
ii)	Height of cloud base	Laser ceilometers
iii)	Rainfall	Drop counting intensity raingauge

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